

REDISCOVERY OF *ZIZIPHUS* *CELATA* (RHAMNACEAE)

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ABSTRACT

The rare Florida endemic *Ziziphus celata* (Rhamnaceae), last collected in 1955 and presumed extinct, was rediscovered in Highlands and adjacent Polk counties. The fruit is here described for the first time.

Ziziphus celata Judd & D. Hall (Rhamnaceae) was first collected by Ray Garrett (*Garrett s.n.*, FLAS) in 1948 near Sebring, Highlands County, Florida, but the specimen remained an enigma for nearly 40 years until recognized and published as a new species by Judd and Hall (1984). At the time of publication, only the single flowering specimen was known, but more recently a sterile collection made by Leonard Brass (*Brass 25333*) in 1955 was found in the Archbold Biological Station Herbarium. It is believed that the Brass specimen may have been collected at the same locality as Garrett's original collection and that Garrett may have taken Brass to the site (J. Beckner, pers. comm.). Since its publication in 1984, several experienced field botanists have searched for *Z. celata* without success until in July, 1987, the senior author discovered a small population in southern Polk County (SE of Frostproof, 31 Jul 1987, *DeLaney 1416*, USF; 5 Aug 1987, *Hansen et al. 11335*, USF). Subsequently, the authors visited the site and submitted a status report (Wunderlin et al. 1980) to the United States Fish and Wildlife Service Field Office for Endangered Species for possible listing of the species as endangered. The species has been proposed by the U.S. Fish & Wildlife Service and is undergoing review (Federal Register 58(188):37818 – 37822). In October 1988, after extensive searches by the senior author, a second population was discovered, this time in Highlands County (SE of Avon Park, 22 Oct 1988, *DeLaney 1901*, USF). The Polk County population is in relatively little disturbed scrub vegetation and the Highlands County site is partially improved pasture on a former scrub site. The condition of the plants at the Polk County site is very poor and apparently declining rapidly. Fortunately, the Highlands County population,

although at an altered site, appears vigorous, indicating that some disturbance may have a stimulatory effect and possibly be essential to its survival. Comparative study of the two sites should yield important information concerning our understanding of the species' habitat requirements, hopefully leading to the development of a more effective management plan.

At the Polk County site, *Ziziphus celata* occurs in scrub vegetation dominated by several *Quercus* species (*Q. chapmanii*, *Q. geminata*, *Q. incana*, *Q. laevis*, and *Q. myrtifolia*), *Bumelia tenax*, *Sabal etonia*, and *Serenoa repens*. The species seems to prefer open sunny areas in the scrub. Although the Highlands County site has been modified, the associates are similar (table 1).

The southern Lake Wales Ridge, to which *Ziziphus celata* is restricted, is an area containing a relatively high number of Florida's endemics. Associates of *Z. celata* include 23 taxa endemic or near endemic (i.e. 90% of the populations occur in the state) to Florida, representing about one third of the total flora recorded at the site (Table 1). Five of these (*Bonamia grandiflora*, *Paronychia chartacea*, *Polygonella basiramia*, *Prunus geniculata*, and *Warea carteri*) are Federally protected species. A sixth, *Liatris oblingerae*, is proposed as such and is presently being reviewed (Federal Register 58(188):37818 – 37822).

Having seen living material of *Ziziphus celata* and herbarium specimens of other *Ziziphus* taxa, we are in agreement with Judd and Hall (1984) that the species is correctly placed in the "*Condaliopsis* group" of *Ziziphus*, following Johnston (1962). It appears most closely related to *Z. parryi* Torrey, a species of arid habitats of northeastern Baja California and southern California. It shares three character states with *Z. parryi* which are not found in the other species in the *Condaliopsis* group: 1) pinnate, basally uninerved leaves; 2) entire leaf margins; 3) obovate or spatulate leaf shape. A fourth unique character state of *Z. parryi*, that of seeds tightly held in the cell, could not be assessed because of the paucity of fruiting material of *Z. celata*. *Ziziphus celata* differs from *Z. parryi* essentially in the color of the floral cup (yellowish-green in *Z. celata* vs. purplish-green in *Z. parryi*) (fig. 3), leaves generally slightly broader and more emarginate (fig. 1), and the tendency toward paired unequal secondary thorns. There also appears to be differences in the length of the style (shorter than the stamens in *Z. celata* vs. subequalling or longer than the stamens in *Z. parryi*) and relative size of the flowers, those of *Z. celata* being slightly smaller, but these features could not be adequately assessed because of the paucity of flowering material of both species.

A single mature fruit (fig. 2) was found in the Polk County population and is here described for the first time for the species: ellipsoid, 1.6 cm

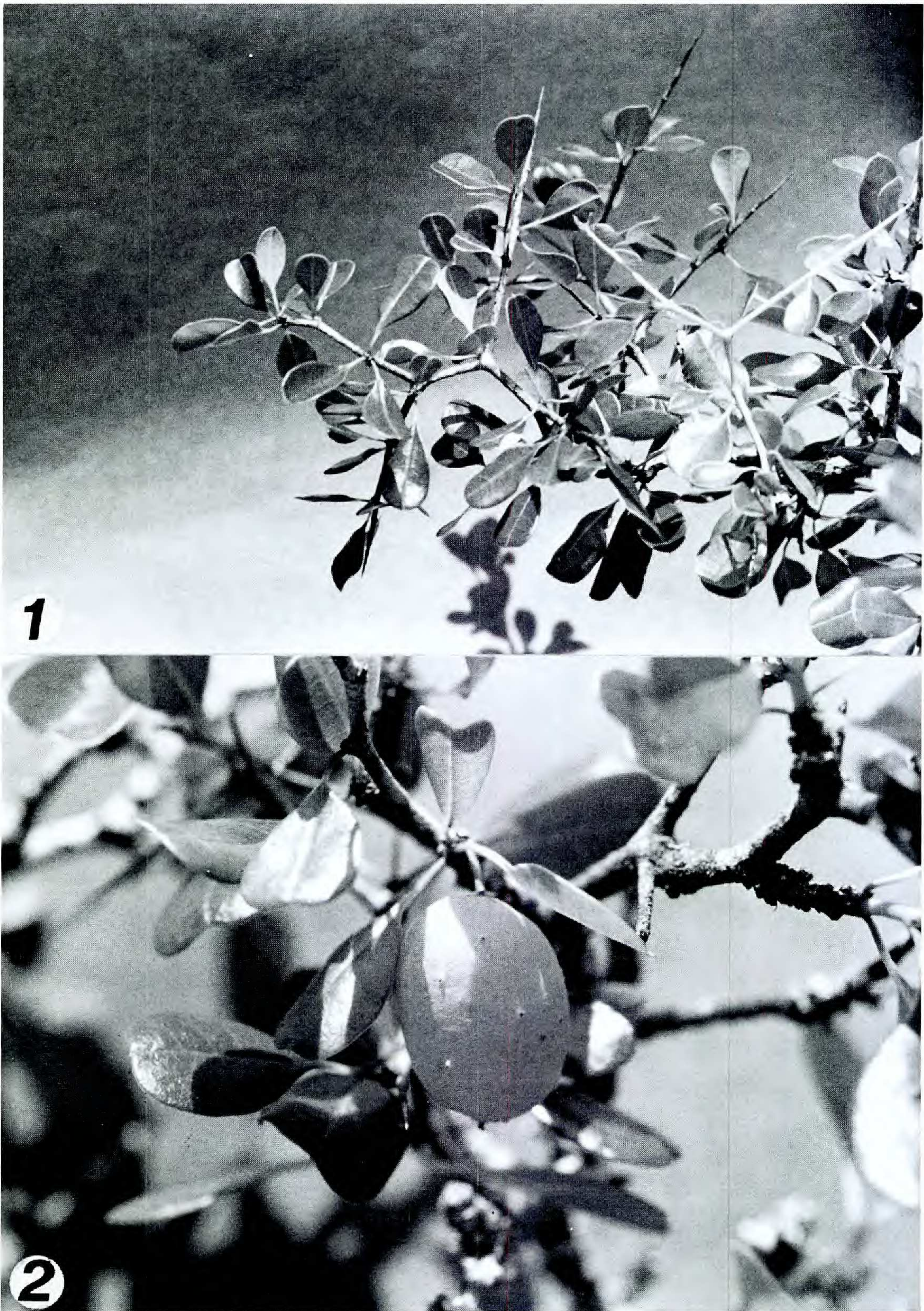


FIG. 1. *Ziziphus celata*: vegetative branch.
FIG. 2. *Ziziphus celata*: fruiting branch.



FIG. 3. *Ziziphus celata*: flower.

long, 1.1 cm wide, with several scattered, small, wartlike projections, the color apple green, flushed with plum, the style persistent as a beak, ca. 2 mm long, the pedicel 3 mm long. The fruit is nearly identical to that of *Ziziphus parryi*.

The exceptionally low seed set in the Polk County population, in spite of attempted hand pollination, is of concern. One possible explanation is that the plants within each population are somewhat self-incompatible because of genetic similarity. There are, however, observable morphological differences between the Highlands and Polk county populations (i.e., tendency toward greater development of paired secondary thorns and less emarginate leaves), and it is likely that these populations are somewhat genetically different. This may indicate an increasing probability of successful seed production resulting from crossing the two populations.

While most of peninsular Florida was inundated in the past, particularly in the Pleistocene, the southern Lake Wales Ridge on which *Ziziphus celata* occurs is believed to have been emergent and available for plant habitation since the late Miocene or early Pliocene (ca. 11 my B.P.). Scrub vegetation in some form has probably existed on the Ridge since that time. It is conceivable that some species currently present on the ridge have persisted since then. The fossil pollen records dating from 37,000 to 13,010 B.P.

TABLE 1. Taxa associated with *Ziziphus celata* (southern Polk Co. population). Voucher specimens are deposited at USE. Taxa endemic or nearly endemic to Florida are indicated with an asterisk (*).

<i>Asclepias curtissii</i> A. Gray *	<i>Opuntia humifusa</i> (Raf.) Raf.
<i>Asclepias tuberosa</i> var. <i>rolfsii</i> (Britton) Woodson	<i>Palafoxia feayi</i> A. Gray *
<i>Asimina obovata</i> (Willd.) Nash *	<i>Paronychia americana</i> (Nutt.) Fenzl ex Walp.
<i>Berlandiera subacaulis</i> (Nutt.) Nutt *	<i>Paronychia chartacea</i> Fern. *
<i>Bonamia grandiflora</i> (A. Gray) Heller *	<i>Paronychia herniarioides</i> (Michx.) Nutt.
<i>Bulbostylis ciliatifolia</i> (Ell.) Fern.	<i>Phoebanthus grandiflorus</i> (Torrey & A. Gray)
<i>Bulbostylis warei</i> (Torrey) C. B. Clarke	S. F. Blake *
<i>Bumelia tenax</i> (L.) Willd.	<i>Pinus palustris</i> Mill.
<i>Callicarpa americana</i> L.	<i>Polanisia tenuifolia</i> Torrey &
<i>Carya floridana</i> Sarg. *	A. Gray
<i>Chamaecrista fasciculata</i> (Michx.) E. Greene	<i>Polygala lewtonii</i> Small *
<i>Centrosema virginianum</i> (L.) Benth.	<i>Polygonella robusta</i> (Small) Nesom & Bates *
<i>Chapmannia floridana</i> Torrey & A. Gray *	<i>Polygonella polygama</i> (Vent.) Engelm. & A. Gray
<i>Chamaesyce cordifolia</i> (Ell.) Small	<i>Prunus geniculata</i> Harper *
<i>Clitoria fragrans</i> Small *	<i>Quercus chapmanii</i> Sarg.
<i>Cnidocolus stimulosus</i> (Michx.) Engelm.	<i>Quercus geminata</i> Small
& A. Gray	<i>Quercus incana</i> Bartram
<i>Commelina erecta</i> L.	<i>Quercus laevis</i> Walter
<i>Crataegus lepida</i> Beadle *	<i>Quercus myrtifolia</i> Willd.
<i>Cyperus retrorsus</i> Chapman	<i>Rhus copallina</i> L.
<i>Dalea feayi</i> (Chapman) Barneby	<i>Rhynchelytrum repens</i> (Willd.) C. Hubbard
<i>Dichantheium aciculare</i> (Desv. ex Poir.)	<i>Rhynchosia cinerea</i> Nash *
Gould & Clark	<i>Sabal etonia</i> Swingle ex Nash *
<i>Diodia teres</i> Walter	<i>Schrankia microphylla</i> var. <i>floridana</i> (Chapman)
<i>Diospyros virginiana</i> L.	Isley
<i>Eriogonum longifolium</i> var. <i>gnaphalifolium</i>	<i>Selaginella arenicola</i> L. Underw.
Gandoger *	<i>Serenoa repens</i> (Bartram) Small
<i>Eriogonum tomentosum</i> Michx.	<i>Seymeria pectinata</i> Pursh
<i>Erythrina herbacea</i> L.	<i>Sisyrinchium xerophyllum</i> E. Greene *
<i>Euphorbia polyphylla</i> Engelm.	<i>Smilax auriculata</i> Walter
<i>Galactia striata</i> (Jacq.) Urban	<i>Stillingia sylvatica</i> L.
<i>Ilex ambigua</i> (Michx.) Torrey	<i>Stipulicida setacea</i> Michx.
<i>Indigofera caroliniana</i> Mill.	<i>Stylisma abdita</i> Myint *
<i>Krameria lanceolata</i> Torrey	<i>Tephrosia chrysophylla</i> Pursh
<i>Lechea deckertii</i> Small	<i>Tillandsia recurvata</i> (L.) L.
<i>Liatris oblongerae</i> (S. F. Blake) B. Robinson *	<i>Tradescantia roseolens</i> Small *
<i>Liatris tenuifolia</i> Nutt.	<i>Trichostema dichotomum</i> L.
<i>Licania michauxii</i> Prance	<i>Vitis aestivalis</i> Michx.
<i>Linaria floridana</i> Chapman	<i>Warea carteri</i> Small *
<i>Lupinus diffusus</i> Nutt.	<i>Ximenia americana</i> L.
<i>Nolina brittoniana</i> Nash *	<i>Yucca filamentosa</i> L.

from Lake Annie in southern Highlands County indicate the presence of a dominant scrub community characterized by *Ceratiola ericoides* Michx., *Polygonella fimbriata* (Ell.) Horton (? = *P. robusta* (Small) Nesom & Bates), *Polygonella ciliata* Meisn., *Selaginella arenicola* Underw., *Quercus* spp., and

various Asteraceae (Watts, 1975). These species still occur in the surrounding areas. The Lake Wales Ridge probably served as a refugium for plants and animals through the Pleistocene. In light of this, it is likely that the two extant populations of *Z. celata* are relictual.

Relatively little is known of the plant's habitat requirements and reproductive biology. Even such basic information as fruit morphology was unknown until early this year. Continued searching for additional populations and protection and study of the two extant colonies is imperative for the species' survival. The two known *Ziziphus celata* sites are privately owned, in areas of high agricultural development and/or adjacent to small residential areas. Acquisition of the property along with introduction of the species into protected areas is needed for this plant's continued existence.

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